IV. COMMUNITY NETWORKS SHOULD NOT BE LICENSED AND SHOULD NOT BE SUBJECT TO AUCTIONS.

A. The Risk Of A "Tragedy Of The Commons" Is Overstated.

The concept of longer-reach point-to-point links, sharing a set of frequencies without formal frequency coordination requirements or mandatory channel-access etiquettes, has aroused visions of chaos in some quarters or, as it is sometimes called, a "tragedy of the commons."[21] In the "tragic" scenario, users' lack of a shared self-interest and self-discipline to employ spectrum-efficient radios is supposed to lead to excessive interference among systems and result in a wasted spectrum resource.

Predictions and fears of a "tragedy of the commons" must not be overstated. Indeed, the entire premise of the "tragedy of the commons" argument is based upon the possibility that community networks will be so heavily used — *i.e.*, are so well suited to meeting unsatisfied communications needs — that interference problems will arise. The argument also requires each user to have neither the means or motivation to understand the actions of others, and to take only selfish courses.

It would be unfortunate to prohibit a much-needed technology because a limited number of cases could arise, at some point in the future, in which excess demand could adversely affect users by, for example, reducing throughput rates. In addition, the entire premise that unrelated groups of individuals operating in close proximity to one another *per se* will engage in greater cooperation than those operating over somewhat longer distances is questionable at best. For example, it is not intuitively obvious that two business firms, each having invested substantial sums in VHR LAN systems, will be more cooperative in resolving interference between their systems than will, for example, a school and library system located in a rural community facing similar problems with their longer distance networks. A combination of information, incentive, and ethic

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[21] See NPRM at ¶ 55.

gives rise to cooperation; these factors do not necessarily correlate with dense user environments or short range operations.[22]

In any event, as with most "parades of horribles," it is unlikely that the worst case scenario in the tragedy of the commons will come to pass. First, NII/SUPERNet devices and systems would operate as computer data, not telephony, networks. In data networks, the "call blockage" one associates with telephone networks does not occur. When data network capacity capabilities are overburdened, traffic presented to the network can be backed off and delivery will slow down. In this instance, some users might choose alternate media or delay transmission.

Second, while all users may not perceive the need to use spectrum-efficient radios, radio manufacturers likely will cooperate to design sharing rules to promote the aggregate value of their combined market and assure the continued viability of this market. In addition, individuals' self-interest in having a usable channel will lead users to cooperate, if the barrier of user and transmitter anonymity can be overcome so that cooperation can be effected. To enhance the opportunities for this type of informal cooperation, several non-intrusive "hooks" should be provided as discussed in Section IV(D) below.

B. Forcing Community Networks Into A Licensed Regime Would Deny Their Benefits To Those Most In Need Of A Low Cost, Flexible Alternative To Existing Media.

In the NPRM, the Commission requested comment on whether community networking operations could be accommodated better on a licensed basis, either in the NII/SUPERNet Band or in another licensed band.[23] The answer to this question is an emphatic "no."

Community networking differs from other unlicensed applications most notably only in that the antenna used provides for directional, rather than omnidirectional, coverage. In every other sense, it can be identical to other types of unlicensed operation. Users may choose other differentiating factors (such as

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[22] Approaches for sharing information about community networking operations and, thereby, overcoming one potential difficulty associated with coordination among geographically separated users is discussed in Section IV(D), *infra*.

[23] NPRM at ¶¶ 48, 56

bandwidth) for any particular application, but the transmitter power itself required for effective indoor VHR LANs and for outdoor, multi-mile point-to-point community network links is the same. In the case of community networks, the signal energy is directed by the antenna in a narrow beam from one "station" to another, whereas LANs usually spread their transmissions throughout a general indoor area.

Users of community networks, even more than those using indoor corporate LANs, understand that they operate under the fundamental rule that they do not have exclusive rights to the spectrum resource and must share that resource with all other devices that comply with the applicable Part 15 rules. For some users, this constraint is unacceptable and a licensed alternative, such as fixed microwave, is appropriate. For others, however, the low cost and ease of use that can be associated with unlicensed operation outweigh the downsides of using shared spectrum.[24]

The Commission itself recognized the benefits of unlicensed, longer distance operation in its recent spread spectrum NPRM, stating:

> "We recognize the advantages of being able readily to establish radio links capable of transmission distances of 10 km, or greater, without the delays and costs associated with frequency coordination and licensing."[25]

This statement applies to spread and non-spread spectrum systems with equal force.

A brief review of the comments submitted in response to Apple's Petition reflect the strong feelings of many individuals and organizations that a portion of

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[24] In the PCS proceeding, the costs of "moving" microwave stations from one frequency range to another, with the locations remaining the same, were commonly estimated to be in the range of $150,000 to $300,000 each, for equipment, installation and other associated expenses. Totally new links might cost similar amounts, representing, in part, equipment redundancy and other measures required to achieve commercial-level service quality. High-quality radios, not including required accessories but suitable for unlicensed spread-spectrum point-to-point links can be obtained today for prices from less than $1,000 to in the range of several thousand dollars. Such costs should drop significantly with higher manufacturer volume. Apple expects high volume to bring prices for community network equipment to fall well below $1000.

[25] Spread Spectrum Transmitters, *supra* n.11, at ¶9.

the spectrum should be reserved for the public on an open, shared basis. Even a licensing system designed with the best of intentions will impose a barrier between many users and the NII/SUPERNet Band that would not have been present in a "purchase and play" environment.

Forcing those who would prefer an unlicensed solution to use a licensed alternative would undermine — perhaps fatally — the development of community networking. Many schools, libraries, community organizations, and other potential users simply do not have the financial and other resources needed to weave their way through the frequency coordination and FCC licensing process. For others, the burdens of this process, while surmountable, would outweigh the perceived benefits of community networking and cause them to abandon their plans. Rather than dictating that users who prefer, or can only afford, an unlicensed alternative must employ a complex, high-cost, high-reliability system or have nothing at all, the Commission should permit consumers to decide which alternative best suits their needs and resources.

B. Licensing Is Not Necessary Either To Prevent Interference Or To Enhance Efficient Spectrum Use

1. Licensing.

There is no reason for the Commission to destroy much of the promise of community networking by forcing it into a licensed model. Given Apple's proposed band plan, community networks do not present an unreasonable threat of interference to others using the NII/SUPERNet Band. In fact, by restricting antenna beams to a very narrow path, these links avoid many of the potential risks of interference presented by shorter range, omnidirectional systems.

Licensing also will not lead to more efficient spectrum use. Licensees have no particular incentive to use their spectrum efficiently, as the Commission has found in its private land mobile re-farming proceeding. Licensees have an incentive to use their spectrum efficiently only if: (i) they have just enough spectrum to accomplish their communications objectives using the most spectrally efficient technologies, and (ii) they do not have access to additional spectrum, or can obtain additional spectrum only at a substantial cost.

If either of these conditions is not present, there is no reason to assume that a licensee will adopt spectrally efficient practices. Moreover, even if the licensee did adopt spectrally efficient practices, the public would benefit from the increased efficiency only if the spectrum freed by such practices was placed into another productive use. If the excess spectrum lay fallow, for example, due to regulatory or practical restrictions on subleasing, the licensed users' efficiency would have no real benefit.

In fact, licensing community network users may lead to decreased spectrum and economic efficiency. In an unlicensed context, multiple users would share a given slice of spectrum on a dynamic, microsecond-by-microsecond, packet-by-packet basis. Users with different peak periods — such as a farm cooperative sharing information during early morning farmers' markets and a community learning center teaching adult education classes in the evenings — would not require their own dedicated channels, each of which would lie fallow during large periods of the day. Even users with overlapping peak periods would share spectrum on a dynamic basis that packs every possible bit of information into the available transmission medium

In contrast, a licensed approach would dedicate a slice of spectrum equal or greater than the minimum bandwidth required to satisfy the users' maximum communications needs — for example, the bandwidth needed to send a multimedia or full motion video bit stream. This spectrum then would be unavailable to other users, even if that bandwidth was used only infrequently — for example, a few hours or minutes a day — or often less intensely than the maximum — for example, most often for lower capacity file transfers and only infrequently for multimedia transmissions. In addition, to the extent that a licensing requirement drives away users who could have been accommodated without harm to others, licensing is economically inefficient.

2. Auctions

Because the Commission should reject any suggestion of licensing community networks, Apple will comment only briefly on the statement in the NPRM regarding potential auctioning of NII/SUPERNet community networking

links.[26] First, the Commission's auction authority would not extend to community networks. Just as fixed microwave links are coordinated by frequency and geography and, therefore, do not give rise to mutual exclusivity, point-to-point community network links — if forced into a licensed regime — could be coordinated by frequency and geography and, therefore, would not give rise to mutual exclusivity. In addition, many or even most of these networks will be used by schools, libraries, community organizations, government entities, and other cooperative groups to meet their members' communications needs. They would not involve networks in which the operator receives compensation from subscribers and, therefore, again fall outside of the Commission's auction authority.

Second, any approach based upon licensing by geographic area, such as BTA or MTA, rather than on a link-by-link basis would recreate many of the problems community networks were designed to overcome. This approach once again would place spectrum in the hands of a single carrier and relegate potential users to the carrier's network buildout and pricing decisions. In addition, if the licenses were awarded by auction, it would become even more likely that the licensees would be for-profit enterprises, whose interests often would depart sharply from the needs of potential users of community networks. Even absent a profit motive, auctions would increase the costs of community networking, thereby driving away some users who, absent the constraints of auctions, could have been accommodated without harm to others.

For the same reasons that licensing of 5 GHz community network links would be unwise and detrimental to the interests of those who would be served by these networks, it would be inappropriate to rely solely on other licensed providers — such as PCS providers or licensees in the 28 GHz, 38 GHz, and above 40 GHz — to satisfy the appetite for community networking.[27] Licensed networks may provide some of the functionalities that would be provided by some community networks, and the authorization of community networking in the 5 GHz band should not preclude those offerings. However, none of these alternatives offers the benefits of unlicensed 5 GHz community networking — in

[26] NPRM at ¶ 56.
[27] NPRM at ¶ 48.

terms of price, flexibility, and end-user control -- and none should be considered an acceptable substitute for unlicensed community networks. Similarly, while the door should not be closed to rule changes in other licensed bands to broaden eligibility, expand flexibility, or otherwise eliminate regulatory barriers,[28] Apple currently sees no way to replicate the benefits of an unlicensed community networking in any licensed band.

C. A Less Burdensome Set Of Rules To Govern Community Network Links Could Be Employed In Lieu Of Licensing.

As noted above, several non-intrusive "hooks" can be used to promote opportunities for cooperation among community network users and, thereby, minimize any theoretical risk of a "tragedy of the commons."

1. Transmitter IDs.

First, the Commission could require that community network links incorporate an imbedded unique transmitter ID and transmit that ID at appropriate intervals in a series of transmissions, much like a requirement for transmitting authorized call letters.[29] This transmitter ID code would be set permanently by the manufacturer and could be used at the point-of-sale or by the professional installer to "register" a "responsible entity" or contact person initially associated with obtaining a device and putting it into operation.

Once a device had been "registered," basic information as to intended frequency use could be entered into a publicly available, on-line data base which, in turn, could be reviewed by potential users and into which actual users could place information about their equipment, such as performance and general location features, including directional path orientation (if any).

2. Informal coordination.

Once a basic registration system is provided for, a system for coordination could be as useful as operators would like it to be or are willing for it to be. Such a system might be particularly effective for relatively fixed, point-to-point

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[28] NPRM at ¶ 48.

[29] A limited set of means of transmitting IDs would have to be allowed, to cover diverse modulation schemes, operating characteristics and other technical factors.

systems. For example, a private coordination entity — such as a local community group or a consortium of those operating community network systems — could designate a gross level of coordination, recommending channel sets for particular classes of users or designating certain frequencies for certain applications in specific geographical areas. Such a regime would be analogous to that employed by licensed private land mobile stations, which do not have exclusive, dedicated spectrum).

A still closer model exists within the Amateur Radio Service. Section 97.205 provides that "(w)here the transmissions of a repeater cause harmful interference to another repeater, the two stations licensees are equally and fully responsible for resolving the interference unless the operation of one station is recommended by a frequency coordinator and the operation of the other station is not. In that case, the licensee of the non-coordinated repeater has primary responsibility to resolve the interference." A "frequency coordinator" is defined as "(a)n entity, recognized in a local or regional area by amateur operators whose stations are eligible to be auxiliary or repeater stations, that recommends transmit/receive channels and associated operating and technical parameters for such stations in order to avoid or minimize potential interference."[30]

3. Further comment.

Prior to adopting any frequency registration and coordination system, the Commission should solicit the views of those who would be affected by the system, in particular potential users of unlicensed community network links. The Commission should seek comment on the following issues: (i) whether the benefits of such a system would outweigh its burdens; (ii) whether an imbedded unique transmitter identifier should be required; (iii) whether an open, publicly accessible database is the best solution; (iv) whether such a database should be maintained on a national, regional, or local level; (v) what entity or entities should be responsible for establishing and maintaining the database; (vi) whether participation would be mandatory (*e.g.*, required under the FCC's rules as a condition for operating "specialized" community networks); and (vii), if mandatory, how participation would be enforced.

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[30] See Section 97.3, Definitions.

D. The Regulatory Implications Of Community Network Interconnection To The Public Switched Telephone Network, If Any, Should Be Addressed In A Separate Proceeding.

In the NPRM, the Commission requested comment on the regulatory implications, if any, of connections between longer range community networks and the public switched telephone network ("PSTN").[31] While the regulatory status of services provided using unlicensed devices may require Commission consideration, this question is not unique to community networks and need not be resolved in this proceeding. It should be noted, however, that connection to the Internet will frequently entail access through a telco, cable operator, or other service provider. Notwithstanding the larger question, some forms of such connections must be permitted.

Unlicensed wireless devices are used in a variety of different situations. Some serve as CPE; others are used to create private networks; still others are used to provide fixed or mobile services to third parties on either a "private" or "common" carrier basis.

There is nothing unique about "community networks" that, necessarily, dictates a particular type of regulatory treatment. Like other unlicensed devices — whether 5 GHz wireless LANs, Part 15.247 spread spectrum transmitters, or general Part 15 devices — they may be connected to the PSTN or may operate as stand-alone networks or in connection with other private networks. If connected to the PSTN, they may replicate private networks or carrier-type networks. While the type of device used to create the communications infrastructure will be common, the type of communications provided and the terms on which they are made available — and, hence, the appropriate regulatory treatment — will not.

Currently, the Commission has refrained from regulating services provided using unlicensed technologies. Even where regulation otherwise would have been imposed, for example in the commercial mobile radio services context, the Commission has chosen not to regulate these services. Apple expresses no opinion on whether this decision should be revisited. However, if it is, it should be addressed in a uniform, comprehensive manner, and should not

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[31] NPRM at ¶ 48.

subject 5 GHz "community network" products to different regulation than other, similar unlicensed products used to provide similar services.

V. THE COMMISSION SHOULD ADOPT TECHNICAL STANDARDS THAT ACCOMMODATE A FULL RANGE OF POTENTIAL NII/SUPERNET FUNCTIONS.

Apple strongly supports the Commission's decision to adopt only minimal technical regulations governing operation in the NII/SUPERNet Band and to leave the development of additional sharing rules to a more flexible industry process. This approach will maximize the diversity of devices that can operate within the NII/SUPERNet Band, while providing adequate "ground rules" to promote efficient spectrum use and prevent interference to other services.

The "interim rules" proposed by the Commission and derived from the rules in Subpart D, however, are not appropriate for use, even on an interim basis. Those rules were developed for a very small frequency domain, a total of 10 MHz. The degree to which the rules were intended to prevent intrusion from certain classes of devices has come close to overwhelming the rules that were intended to promote communications.

Rather than adopt interim rules, the Commission should adopt an approach similar to that employed in the millimeter wave proceeding. Specifically, the Commission should set strict timeframes within which industry must complete its work on developing a set of sharing rules. With respect to rules governing the VHR-only bands, the Commission already has expressed its clear intent to authorize this type of operation. The rules for these sub-bands, however, will be relatively complex. As a result, Apple proposes that sharing rules for the VHR bands be developed within one year of the NPRM date, or by June 6, 1997. With respect to rules governing the remaining portion of the NII/SUPERNet Band, the period should start only with a final decision in this proceeding resolving the issues surrounding the operation of longer distance links. Because these rules will be open and relatively straightforward, however, the time needed to complete them should be somewhat shorter than for the VHR rules. Apple, therefore, proposes that sharing rules for the non-VHR bands be developed within six months of the date on which a Report & Order in this proceeding is released by the Commission.

In addition, the Commission should take steps to assure that the process for developing sharing rules is open and reflects the widest possible set of views. Various organizations have developed substantial expertise and will be able to contribute greatly to the development of flexible rules that maximize prospects for sharing and the efficiency of the NII/SUPERNet Band. The Commission also should assure that sharing rules are not overly restrictive and do not deny access to the band. In this vein, Apple strongly supports the Commission's proposal not to propose any channelization plan for the NII/SUPERNet Band.

Finally, Apple concurs with the Commission's proposal that NII/SUPERNet devices, like all other Part 15 devices, should be required to accept any interference caused by licensed services sharing the band.[32] Apple urges the Commission, however, to state its intention not to introduce new licensed services into the NII/SUPERNet Band and not to permit any existing licensed service fundamentally to alter the conditions under which that service currently operates. This approach will provide the protection required by licensed services, including the MSS service, without introducing unacceptable levels of uncertainty into the NII development and deployment of NII/SUPERNet devices.

VI. THE COMMISSION SHOULD ENDORSE THE PRINCIPLES UNDERLYING APPLE'S PROPOSED "PART 16" APPROACH BUT NEED NOT CREATE A NEW "PART 16" IN ITS REGULATIONS.

In both its NII Band Petition and its earlier Data-PCS Petition for Rulemaking, Apple described the conditions required for unlicensed devices to thrive and described this set of characteristics as a "Part 16" paradigm. Under a "Part 16" approach, unlicensed devices would be treated as a recognized radio service, would operate in protected spectrum reflected in the Part 2 Table of Frequency Allocations, and would be subject to a set of spectrum sharing rules that ensure all devices have fair and equitable access to the spectrum resource.[33]

Apple continues to believe that these attributes are essential to the development of highly reliable unlicensed technologies, and therefore urges the Commission to adopt a "Part 16" approach with respect to the NII/SUPERNet

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[32] NPRM at ¶ 54.
[33] Apple Petition at 5-6; NPRM at ¶ 57.

Band. It is not essential, however, that the Commission formally create a "Part 16" in its rules. As the NPRM makes clear, the substance — and not the form — of the Commission's approach to the NII/SUPERNet Band is what is important.

Apple, therefore, recommends that the Commission adopt an approach similar to that used for the Data-PCS bands at 1910-1930 MHz and 2390-2400 MHz and the millimeter wave bands at 59-64 GHz. Specifically, the Commission should:

- Treat the NII/SUPERNet Band as a recognized radio service by making 350 MHz available for NII/SUPERNet operation and referring to NII/SUPERNet use in the Table of Frequency Allocations. Such a reference would be identical to those included for the 1910-1930 MHz, 2390-2400 MHz, and 59-64 GHz bands.

- Provide the spectrum certainty required for reliable operations. In particular, the Commission should make clear that it will not introduce new, incompatible services into the NII/SUPERNet Bands.

- Promote the development by industry of sharing rules and assure that any such rules provide fair and equitable access to the spectrum for all NII/SUPERNet devices.

This approach is fully consistent with both the Communications Act and Commission precedent. It is identical to the approach adopted for the Data-PCS and millimeter wave bands: in each of those cases, spectrum was dedicated to unlicensed use, this use was reflected in the Table of Frequency Allocations and, at least tentatively, operation was made subject to compliance with a set of spectrum sharing rules. In addition, this approach builds upon the Commission's decisions in the LMS and spectrum reallocation proceedings, in which the Commission declined to take spectrum away from unlicensed operation in order to accommodate new licensed services.

Finally, this approach addresses the Commission's obligation under Section 303(g) of the Communications Act, 47 U.S.C. § 303(g), to "study new uses for radio ...and generally encourage the larger and more effective use of radio in the public interest," as well as its obligation under Section 706 of the Telecommunications Act of 1996 to "encourage the deployment on a reasonable

and timely basis of advanced telecommunications capability to all Americans (including, in particular, elementary and secondary schools and classrooms) by utilizing ...regulatory methods that remove barriers to infrastructure investment."

CONCLUSION

For the reasons stated herein, Apple supports the Commission's efforts to create a new NII/SUPERNet Band in the 5 GHz range and urges the Commission promptly to implement this Band. In particular, Apple urges the Commission to adopt rules that will encourage the development of community networking within the Band, as outlined in these comments.

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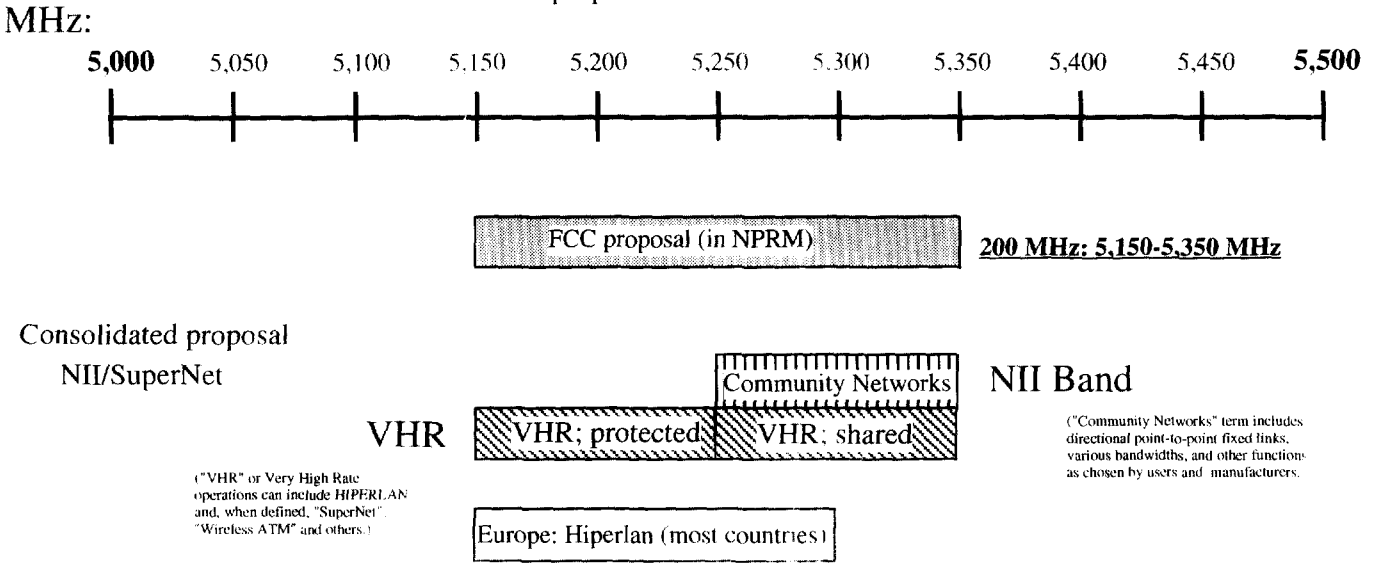
July 15, 1996

5 GHz Band (lower portion): present use; FCC proposed (per NPRM); consolidated NII/SUPERNet proposal.



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Thursday, July 11, 1996
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5 GHz Band (upper portion): present use; FCC proposed use (per NPRM); consolidated NII/SUPERNet proposal